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THE U.S. MILITARY AND INTERNATIONAL
ENVIRONMENTAL SECURITY

by

Roberta B. Carr

December 1993

Thesis Advisor:

R. Kennedy-Minott

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The Greening of Global Security:
The U.S. Military and
International Environmental Security

by

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Commander, United States Navy
B.A., University of West Florida

Submitted in partial fulfillment
of the requirements for the degree of

MASTER OF ARTS IN NATIONAL SECURITY AFFAIRS

from the

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ABSTRACT

This thesis examines the roles and missions of the U.S. military, and compares them to potential international environmental conflicts. Five specific environmental issues are examined in detail: deforestation, fresh water, nuclear contamination, overpopulation, and ecological terrorism. Ten U.S. military roles are also examined in detail: communications, interdiction, enforcement, education and training, assistance, leadership, warfighting, surveillance, intelligence, and deterrence. Analysis reveals that the U.S. military can play a support role in the majority of the environmental conflict issues. Use of force roles apply to fewer of the environmental issues. The U.S. military's primary use of force role of warfighting applies only to one environmental issue.

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EXECUTIVE SUMMARY

Since the end of the Cold War, new issues have come to the forefront of global attention. One of these issues is renewed appreciation for the importance of the natural environment, and its inextricable link to critical security issues. In examining this linkage, five environmental issues are analyzed with respect to their validity and their potential for conflict: deforestation, fresh water, nuclear contamination, overpopulation, and ecological terrorism. Each of these issues is analyzed with respect to its potential for national, regional, or inter-regional conflict. To compare the role of the U.S. military in these potential environmental conflicts, ten U.S. military roles are also analyzed: communications, interdiction, enforcement, education and training, assistance, leadership, warfighting, surveillance, intelligence, and deterrence. In comparing these U.S. military roles against the five selected environmental issues, it becomes evident that the U.S. military roles can be subdivided into five "support" and four "use of force" roles, with education and training falling into its own separate category. The U.S. military can conduct "support" roles, i.e, communications, assistance, leadership, surveillance and intelligence, in each of the five environmental issues. Education and training is a role that the U.S. military can currently apply only to the single environmental issue of nuclear contamination. The "use of force" roles of interdiction, enforcement, and deterrence can apply to four of the five selected environmental issues, the exception being overpopulation. Warfighting, the

primary U.S. military role, only applies directly to one selected environmental issue: ecological terrorism.

The U.S. military can play some role in all of the selected environmental issues. The new Naval and Joint Military Doctrine Commands should consider the eventuality that the U.S. military will be called upon to respond to an environmental security mission. The U.S. military planners, especially strategic planners, must begin to address the reality of environmental security as a future mission. By using the same skills so familiar in planning for conflict during the Cold War, and applying them to the new challenges of environmental security, the U.S. military can be prepared when called upon to respond to this new threat.

I. INTRODUCTION

The decade of the 90s dawns with a new light: the world can finally capitalize on the opportunity to expand its vision beyond the narrow scope of the Cold War. Issues virtually ignored only five years ago now exhibit a new luster, a new importance, a new resonance among countries of the world. International, regional, and national security issues are expanding at tremendous rates, enveloping entire new areas of thought, and posing new questions without ready answers. One of the newest and most expansive of these issues is renewed appreciation for the importance of the natural environment, and its inextricable link to critical issues of national strength, regional confidence, and international security.

The military traditionally plays the key operational role in any issue concerning security, be it national, regional, or international. Historically, the military's security roles have been well defined, roles which primarily focused on the use of arms and the employment of force. Recently, roles and missions of the U.S. military have expanded to include more non-traditional areas of the national interest, such as anti-drug operations and humanitarian assistance campaigns. With the increased importance of the natural environment as a national security interest of the United

States, and an issue of growing international importance as well, the military may soon be shouldering responsibility for additional non-traditional missions encompassing environmental issues.

A. AREA OF RESEARCH, RESEARCH QUESTIONS, AND ASSUMPTIONS

This thesis will investigate the growing importance of the natural environment in national, regional, and international security. Additionally, it will address the potential roles that the U.S. military might acquire in environmental security. The questions addressed by this research include: Should the environment have an influential role in national, regional, or international security? Does the natural environment have the potential to lead to national, regional, or international conflicts? If so, how might such conflicts occur? Does the U.S. military (i.e. DOD) have the capability to address potential environmental security issues? Which military roles are best suited to meet this potential environmental challenge? If the U.S. military can perform a role in addressing potential environmental conflicts, which specific roles apply?

The application of the terms "role" and "mission" in this thesis differs somewhat from their definitions used in the February 1993 Roles, Missions, and Functions of the Armed Forces of the United States. The definition of role in that document is as follows:

Roles are the broad and enduring purposes for which the Services...were established by Congress in law. In broadest terms, the role of the

Services today is to organize, train, and equip forces, the Army for prompt and sustained combat incident to operations on land; the Navy for prompt and sustained combat incident to operations on and from the sea; the Air Force for prompt and sustained offensive and defensive air operations; the Marine Corps for service with the fleet in the seizure or defense of advanced naval bases, and the conduct of such land operations as may be essential to the prosecution of a naval campaign; and Special Operations Command for special operations activities or missions. [Ref. 1:p. 1-2, 1-3]

In this thesis, the term role is used as a deed or action the U.S. military is capable of performing. Roles in this thesis are action verbs, that is, something that is performed.

The Roles and Missions document also defines missions as "the tasks assigned by the President or Secretary of Defense to the Commanders-in-Chief (CINCs) of combatant commands." [Ref. 1:p. 1-3] Similarly, mission in this thesis is used to describe a specific job assigned to the military, where the military employs a specific role toward achieving that mission. In other words, the U.S. military performs a role to accomplish a mission.

B. SCOPE AND METHODOLOGY

This thesis examines the role and mission of the military in potential environmental conflicts by using comparative analysis. Initially, the thesis spotlights five broad environmental issues and their potential to foster conflict. The immediacy and validity of each issue is analyzed, and essentially prioritized based on its potential

for fostering national, regional or global conflict. By further comparing these environmental issues with each other, common elements are identified. The analysis then produces a comparative matrix, with the common elements of each environmental issue clearly indicated.

Additionally, this thesis compares current U.S. military roles and missions to the common environmental elements identified in the matrix. This additional comparative analysis enables the thesis to draw conclusions as to which environmental issues might be addressed using U.S. military roles and missions, and which appear outside the scope of a U.S. military solution. Finally, this thesis draws conclusions as to which potential environmental conflicts might be amenable to a U.S. military solution.

II. ENVIRONMENTAL ISSUES AND NATIONAL SECURITY

The explicit linkage between the natural environment and national security is a relatively recent phenomenon. President George Bush formally linked the two concepts for the first time in his January 1993 National Security Strategy of the United States. President Bush's perspective on the environment was that a healthy environment meant a healthy economy, and a healthy economy meant robust national security. [Ref. 2] This connection has only recently been given the publicity and the interest to warrant such a change in ideology. Healthy eco-systems linked to a nation's security is not really a new idea, but because of the ending of the Cold War, the bond between a healthy environment and vigorous national security is now receiving more serious consideration.

A. DEFORESTATION

Deforestation, the current destructive method of harvesting forests which leaves little remaining for sustainable development, continues throughout the world at a phenomenal rate. Because of such harvesting methods, the practice of deforestation degrades the soil more intensively than any other activity. An estimated 40 percent of

soil degradation in Asia and 41 percent in South America is the result of deforestation, due to both careless logging practices and land clearing for agriculture. The destructive process is systematic: first, heavy logging machinery or bulldozers destroy soil structure. After trees are cleared, the tract is often burned. Some of the nutrients from the burning forest quickly reenter the soil as ash. But these mobile nutrients also leach out rapidly, so that initial bumper crops are reduced after a few harvests. What nutrients remain after wind or water erosion can hardly permeate the compacted and sometimes chemically-altered crust.[Ref. 3:p. 326] Many common methods of timber harvesting result in irreparable damage to the remaining soil.

The United Nations Food and Agriculture Organization found that the world is losing nearly 1.3 acres of tropical forest a second, with the largest areas of forest loss centered in Latin America, Asia, and Africa. See Table I. [Ref 3:p. 327]

TABLE I: ANNUAL DEFORESTATION AROUND THE WORLD, 1981 - 1990			
World Region of Countries	Number	Area Deforested (thousand acres)	Annual Rate of Change (%)
Latin America	32	20,509.3	-0.9
Asia	15	8,895.6	-1.2
Africa	40	12,355.0	-0.8

The Amazon Rainforest in South America is the largest tropical rainforest in the world. Many varieties of conflicts are common in the eight nation Amazon region. Today, there is major controversy surrounding the hypothesis that the Amazon Rainforest acts as the "world's lungs," that the forest's massive trees actually absorb the world's carbon dioxide, while also producing oxygen. Harvesting of the Amazon Rainforest continues unabated, especially due to Brazil's desperate economic situation. Brazil is wary of potential interference from other countries concerned about global deforestation. This wariness stems from the various discussions about the possibility of internationalizing the Amazon Rainforest to benefit the world's atmospheric ecosystem. The concept of internationalizing for environmental security reasons has gained Brazil's attention.

In Southeast Asia, especially in Laos, Malaysia, and Thailand, unrestricted cutting of the rainforests continues at phenomenal rates. This timber harvesting has been justified exclusively due to the critical economic needs of these poor countries. In this region, as in others, the displaced peasants shift from the areas of mechanized deforestation into uncultivated forests, where they themselves employ slash and burn techniques in clearing land for agriculture. Slash and burn techniques are essentially the more primitive forms of destructive deforestation. With such diverse and effective forms of deforestation occurring at massive rates, the world's forests do not have the capacity to replenish themselves.

Due to the massive amounts of timber harvesting throughout the world, including inside the United States, forests have shrunk to mere shadows of the great forests that once blanketed the world. In the U.S., only 10 to 15 percent of today's U.S. forests have never been cut. [Ref 3:p. 177] Excessive timbering can lead to devastating ecological consequences, ranging from destroying fruitful rivers and streams, to devastating soil erosion, to disrupting the delicate balance of entire ecosystems.

Old growth forests in the United States are a special category of forests. Old growth stands contain significant numbers of large, live old trees, defined as 150 years for white pine trees and 3,000 years for bristlecone pines. Also critical is the presence of large snags, or dead trees, which is critical to the definition of old growth. [Ref. 3:p. 179] In the United States, political controversy rages over the harvesting of old growth forests in the Pacific Northwest, and was one of the major political issues during the campaign for presidency in 1992.

The earth's forests were a major topic at the United Nations Conference on Environment and Development (UNCED), also known as the Earth Summit, held in Rio de Janeiro in Brazil, on June 3-14, 1992. One of the few accords sanctioned by the vast majority of summit attendees was the Statement on Forest Principles. The major reason this treaty was sanctioned was not because it was a good idea, but because it was not binding--the developing southern nations were not interested in having the more developed northern nations produce a convention restricting the

rights of the lesser developed countries to harvest their own forests. It became, as so many other issues do, a sovereignty issue. Developing countries, led by India and Malaysia (the world's largest exporter of tropical timber), insisted that forests are subject only to the sovereign decisions of the nations in which they occur--and thus that their uses and their management could not be subject to an international treaty. Developing nations pointed out that the industrial North long ago cut down many of their forests, converting vast areas to farmland or other uses that helped to enrich those countries; the developing nations insist on the right to do the same with their forests, if they so choose. Developed countries tried to negotiate principles that would put some moral pressure on countries to preserve their forests or to manage them sustainably, but the final document, a Statement of Agreement on Forest Principles, does more to legitimize existing practices than to protect forests. [Ref 3:pp. 11-12] An important point to this non-binding convention relating to the responsible use of the world's forests was that it enabled the United Nations to formally begin negotiations on an international forest treaty, and placed the issue of global deforestation firmly on the international agenda. [Ref 4:p. A8]

As an issue for global conflict, deforestation has yet to reach a level of significant international global concern. Suspicion still exists concerning the validity of the global threat from deforestation. Even the concept that the Amazon Rainforest acts as the "world's lungs" may not be entirely correct. German scientist Harald Sioli wrote in 1982, "Trying to relate the existence or disappearance of the Amazon

forest...to the oxygen production on earth, is naturally nonsense and invented only for propaganda reasons." [Ref 5:p. 64]

The facts remain clear, however, that the world's massive deforestation is continuing at phenomenal rates due to population growth and a desire for economic growth/foreign exchange. Deforestation is seen as an economic issue which is significantly more important to the developing world than to the developed one. Protecting the world's forests has become an economic, political, and ideological north-south issue, as evidenced at the Earth Summit.

B. FRESH WATER

The availability/scarcity of the supply of fresh water is quickly becoming a major environmental issue for potential conflict. Historically, especially in the Middle East, the supply, demand, and control of fresh water has always been a contentious issue; as time goes by, the potential for escalated conflict only grows. Of 214 major river basins in the Middle East, three-quarters are shared by various combinations of at least two nations, and one-quarter by three to ten nations. [Ref. 6:p. 47]

Although the Jordan River is the smallest of the major rivers in the Middle East, it flows through one of the most volatile regions on earth. The Jordan River provides fresh water for Israel, including the West Bank and the Golan Heights; for Jordan; and for Syria, via the Yarmuk River tributary. Various plans for dams along the river have raised the potential for conflict. These dams only become more and more necessary

as the population of the Middle East soars: Jordan's population is projected to increase by 73 percent by the year 2010, Syria's by 80 percent, Israel's by 30 percent, and the West Bank's by 41 percent. [Ref 6:p. 40] To quote influential and informed men of the region: former Israeli minister of agriculture, Meir Ben-Meir stated, "If the people of the region are not clever enough to discuss a mutual solution to the problem of water scarcity, war is unavoidable." And King Hussein of Jordan has declared that water problems will be the only justification for his country to go to war again with Israel. [Ref 6:p. 42]

In September 1993, the U.S. National Press Club hosted Palestinian Liberation Organization (PLO) chairman Yasser Arafat. During that Washington discussion, Arafat stated emphatically that fresh water was a critical concern in the region, especially in the Gaza Strip. He indicated Palestinians were experiencing poor health and even death due to kidney problems associated with a lack of fresh water. Arafat stated that, with the developing boundaries between Israel and Palestine along the Jordan River, access and use of the fresh water are critical issues--the solution of which requires continued cooperation between the two nations.

The Euphrates and Tigris Rivers also may see increased tensions along their banks. These rivers rise in Turkey and flow through Syria into Iraq. Turkey plans to build the Anatolia Project: thirty-eight hydroelectric and irrigation works on the upper reaches of both rivers. With these major hydroelectric and irrigation projects, downstream users are likely to be faced with reduced flows and increased levels of

pollutants in the water. The downstream users of these waters are Syria and Iraq--not known for their political, ethnic, nor religious passivity.

Additionally, Syria plans to further divert the Euphrates' waters for its own irrigation projects, thereby increasing the likelihood that the final end user--Iraq--may be faced with even further polluted fresh water. The new Syrian dam, according to Iraqi estimates, would oblige Iraq to shut down four power plants that supply 40 percent of the country's electricity. And, as a measure of the validity of the potency of water as a true security threat, Turkey has not hesitated to propose interfering with the Euphrates' flows into Syria in retaliation for Syria's support of Kurdish separatists in Turkey. [Ref 6:pp. 43-44]

The Nile River also has great potential for regional conflict. Egypt, ever influential in Arab regional politics, is heavily dependent on the Nile River for its livelihood. The growing population of Egypt will only be placing greater and greater demands on the river's finite resources. Egypt's current population of 57 million is projected to reach 71 million by the year 2000, and up to 103 million by 2025. Heavily dependent on agriculture to feed its people, Egypt is rapidly reaching the point where the Nile River will not be able to service Egypt's demands. Additionally, the upstream nations along the Nile are placing increasingly greater and greater demands on the river. Sudan, Ethiopia, Uganda, Rwanda, Burundi, Zaire, Kenya and Tanzania are also looking toward the Nile River for irrigation of their crops, and reducing their

dependence on scarce rainwater. As can be seen, the Middle East region is rife with potential for fresh water conflicts.

But the Middle East is not the only region with this type of environmental problem: Africa has suffered for decades from a lack of fresh water. Most of its problems stem from population stress. Somalia, Ethiopia and Sudan are only three African nations which are experiencing internal strife from a lack of fresh water. Linking the highest of birth rates with the driest of regions equates to a high scale of human suffering which eventually leads to conflict.

Fresh water concerns also expand outside the Middle Eastern/African regions. The Aral Sea in the former Soviet Union further illustrates the devastation of excessive water use. The Aral Sea, once the world's fourth largest fresh water lake, has been reduced to almost half its original size due to irrigation demands. Additionally, due to human negligence, the water left in the Aral Sea has become polluted with salt, and thus is now unsuitable for agricultural purposes.

C. NUCLEAR CONTAMINATION

Radioactive contamination from the former Soviet Union has circled the globe through atmospheric transference. Fallout from nuclear power plant accidents, like the 1986 Chernobyl explosion, still impact the livelihoods of regional neighbors.

Nuclear waste disposal and storage is also a growing global contamination issue. The problems surrounding past, present, and future practices associated with

Russian nuclear waste recently made headlines when in 1993, Russia published their White Paper: "Facts and Problems Related to the Dumping of Radioactive Waste in the Seas Surrounding the Territory of the Russian Federation." [Ref. 7] The White Paper was ordered by Russian President Boris Yeltsin in October 1992. The analysis was conducted by the Yablokov Commission, headed by Alexei Yablokov, the President's Ecological Advisor. The White Paper disclosed a Russian legacy of nuclear waste ocean dumping spanning decades, dumping which was not only conducted inside Soviet territorial waters, but which spanned the globe as far afield as the Sea of Japan and the White Sea. The White Paper revealed ocean dumping of not only low-level and high-level radioactive waste, but also the ocean disposal of 18 entire nuclear reactors, and the accidental and intentional sinking of five complete nuclear submarines, some with their full complement of nuclear weapons still on board. The former Soviets estimate some 2.5 million curies of high-level radioactive waste were thrown overboard in the 1940s and the 1950s alone--twice the known total of the 12 other nuclear powers combined. [Ref 8:p. 13]

The White Paper also revealed the critical condition of the former Soviet land-based nuclear waste disposal sites. The hazardous conditions surrounding the current practices of land based nuclear waste storage are the very reason that the former Soviets dumped so much solid and liquid nuclear waste at sea. The most alarming aspect of this radioactive waste disposal investigation is the overt admission by the former Soviets that they will continue to dump radioactive waste at sea, that their

practices have not changed, and that nuclear waste is being dumped at sea as of this writing.

The conclusion of the White Paper reveals that both the Northern Fleet and Pacific Fleet are storing approximately 30,000 spent fuel assemblies¹, corresponding to the contents of about 140 reactor cores from nuclear submarines. Currently, spare storage remains for only another 3 cores.

Because of the lack of land based storage, the Yablokov Commission states that the former Soviet Navy is not ready to completely halt disposal of all types of radioactive waste into the oceans until the completion of land based reprocessing sites--optimistically set for 1997. The Paper concludes that ceasing the sea dumping of radioactive waste is currently impossible. [Ref 7:pp. 28-29]

Disposing of former Soviet submarines is causing insurmountable problems for Russia. Between mid-1989 and 1993, over 80 Russian nuclear submarines were removed from service. Arms control treaties and continuing economic problems will force the retirement of nearly 80 more by the year 2000. Most of these submarines contain 2 nuclear reactors, leaving about 300 reactors for disposal. Russia is now facing an acute problem at every step of the way--from removal of the fuel, to the scrapping of the submarines, to the safe disposal of the radioactive reactor vessels. According to Russian Navy Captain Pavel Smirnov, who is responsible for the

¹ An assembly is a bundle of long fuel rods containing uranium pellets, which are loaded into nuclear power reactors.

decommissioning of submarines in the Pacific Fleet, only half of its 35 retired submarines have had their fuel removed. The Northern Fleet is in even worse shape-- fuel has been removed from only a fourth of its 45 retired submarines. Captain Smirnov says the Pacific Fleet can barely process 1.5 defueled submarines a year. By 1993, only four Pacific Fleet submarines had been completely scrapped. He estimates that it will take 30 to 40 years to dispose of the 60 submarines the fleet will retire by the year 2000. In the Northern Fleet, the scrapping process has scarcely begun.

The Pacific Fleet has had to develop a provisional solution to storing the reactor vessels because it lacks land based storage sites. At the scrapping yard at Bolshoi Kamen in the Far East, the submarines are stripped of their outer shell and dismantled. The reactor compartment and two adjoining compartments are retained as a unit, which is then hermetically sealed so they will float. These units are towed to storage sites at the Pavlovsk nuclear submarine base near Vladivostok, where they float in the water at dockside. [Ref 9:pp. 7-8]

The unknown and undocumented consequences from the former Soviet Union's nuclear contamination is a Soviet legacy. Some contamination continues to significantly impact the health and livelihoods of dozens of neighboring nations, while other consequences have yet to be experienced.

D. OVERPOPULATION

Some stresses attributed to overpopulation have already been discussed with reference to fresh water and the Middle East/Africa. The increase in the numbers and types of environmental stresses due to growing world-wide overpopulation are only a matter of time. Overpopulation in the countries of the world has contributed significantly to desertification, deforestation, environmental pollution, mass migrations of refugees, and starvation. More than 90 percent of the annual increase in population throughout the world is in developing nations, and over half in Africa and southern Asia. The statistics are sobering; see Table II. [Ref 6:p. 154]

TABLE II: WORLD POPULATION BY REGION, 1992 - 2025 (millions) Projected Annual Growth Rate, 1992				
Region	1992	2000	2025	Percent
Developed Countries	1224	1274	1392	0.5
Developing Countries	4196	5018	7153	2.0
Africa	654	884	1540	3.0
Asia	3207	3718	4998	1.8
Latin America/Caribbean	453	535	729	2.1
North America	283	298	363	0.8
Europe	511	515	516	0.2
Oceania	28	31	39	1.2
World	5420	6292	8545	1.7

Environmental problems are now causing sizable cutbacks in food production at a time when population growth continues to soar. Soil erosion, pollution, salinization and waterlogging of irrigated lands all take their toll on agricultural production rates, which in turn causes less and less food to be produced in some of the most populated regions of the world.

Additionally, historical studies indicate that population bulges, especially in the youth of the nation, also contribute to internal strife and instability. [Ref 10] The vast majority of populations in Africa, with the fastest growing populations in the world, have these population bulges in the teenage to young adult ages. Population factors

such as these above combine to make Africa, as well as most of the developing world, very susceptible to national and/or regional conflicts.

E. ECO-TERRORISM

Ecological terrorism is potentially the next issue of environmental crises looming on the horizon. Although not in existence by name, and not regularly in the headlines of global publications, eco-terrorism has the potential to become the next most "fashionable" threat. With the environment now becoming one of the most important issues today in all facets of international society, the decade of the 1990s seems ripe for eco-terrorism.

Eco-terrorism is not unprecedented. The scorched earth strategy dates back for thousands of years. Salting of the earth to thwart agriculture is described in the Bible. But the dawning of the 1990s saw a new appreciation for eco-terrorism born from the oil fires in the Persian Gulf. Saddam Hussein's defensive strategy of igniting over 600 of Kuwait's oil wells, and causing a devastating oil spill in the Persian Gulf, heralded a new beginning for eco-terrorism. Due to the growing impact of rapid communications (such as CNN), and the heightened environmental awareness of a very attentive global audience, ecological disasters such as burning oil fields and maritime oil spills acquire greater shock value than ever before. People do not now have to encounter environmental disasters first hand--television, journals, and radio bring it into the world's living rooms in nearly real time. Environmentally sensitive

Americans can experience environmental devastation from a source thousands of miles away as a matter of course.

Even closer to home, Americans might begin to consider such arson-induced fire losses as those in Laguna Hills and Malibu, California, in the Fall of 1993, as the work of a new breed of eco-terrorist, whose motivation and nationality still remains obscure. If such incidents were proven to be of non-local origin, the ramifications and inadequacies of current law enforcement practices almost dwarf the imagination.

With such a powerful tool to wield against the world, it will only be a matter of time before terrorists take advantage of the situation. Instead of bombing the World Trade Center, think of the impact those terrorists would have made by hijacking an oil supertanker, igniting it, and causing a major oil spill in New York harbor--or off the coastlines of Los Angeles, San Francisco, or Miami Beach. The potential is there, and the potential is real. Unless we plan for it, the consequences could be devastating.

III. POTENTIAL FOR ENVIRONMENTAL CONFLICT

In assessing the potential for conflict, and characterizing the possible nature of that conflict, it is useful to remember that conflict can be defined using any number of characteristics. For this particular analysis, conflict is defined as armed combat, with no distinction between full scale engagement or low intensity conflict. Each represents an extreme range on the spectrum of armed conflict, with its own unique set of characteristics, but the common denominator for both remains active fighting with designated enemy forces. Economic sanctions, political maneuverings, and the like, are not considered conflict in this context. In short, conflict equates to battle.

Additionally, the areas of conflict--national, regional, or inter-regional--are defined as the likely spheres of combat. National conflict is defined in this analysis as conflict limited in scope to within national borders, i.e., internal combat. Regional conflict is defined here as conflict which transcends borders, but which is confined to a specific region in the world, i.e., Middle East, Africa, North America, or Asia. Inter-regional conflict, characterized as a subset of international conflict, is defined as conflict which transcends regions, i.e., Middle East vs North America, Africa vs Europe.

Applying these assumptions to the realm of environmental issues presents a unique perspective in this analysis. By predicting the likelihood of conflict for the five designated environmental issues, as well as the nature of that conflict, this examination will provide the framework for further comparisons against likely U.S. military roles and missions.

A. DEFORESTATION

Deforestation in the tropic regions of the world leads to economic dislocations, political instability, and armed conflict. A good example of this process is the deforestation along the Ganges River system. Very dependent on tree cover in the catchment foothills of the Himalayas, monsoonal flooding has become so widespread that it regularly imposes damages to crops, livestock, and property worth \$1 billion a year among downstream communities of India and Bangladesh, even though the main deforestation occurs in another country altogether--Nepal. The result is deteriorating relations among the three governments; India shouts at rather than speaks to Bangladesh, and it has recently broken off diplomatic ties with Nepal. [Ref 6:pp. 18-19]

Author Norman Myers describes a litany of deforestation-caused conflicts:

In the Sarawak sector of eastern Malaysia, forest tribes who also watch their homelands disappearing before government-sponsored chainsaws regularly engage in head-to-head opposition to officialdom. More serious still, disaffected forest peoples provide support for rebel forces in northern sectors of Thailand and Myanmar (Burma). Similarly, in Peru, where three-quarters of the rural populations is landless or possesses too little land to sustain a farming livelihood, the forests and the

impoverished peasantry of Amazonia supply a base for the Shining Path insurgents. There are other instances in Indonesia, Colombia, and Guatemala, whether large or small in scope, and we can expect them to multiply as forestlands feature fast-growing multitudes of destitute peasants. [Ref 6:p. 93]

While the potential for conflict due to deforestation is high, it is also limited in scope at this time to national and regional levels. As seen above, national and regional conflicts are occurring regularly, prompted by issues of deforestation. The likelihood that separate regions will engage in inter-regional conflicts over deforestation remains low at this time, nor does it appear likely in the near future. Universal concern over national sovereignty overrides international or inter-regional interference in deforestation issues. Any conflicts arising as a result of deforestation have been, and will continue to be confined to specific regions and individual countries. As evidenced at the Earth Summit, international interest does not reach beyond the level of general interest, conferences, and political negotiation.

B. FRESH WATER

Armed conflict over fresh water has great potential to erupt in the near future, and to quickly expand into the inter-regional arena. As discussed in the previous chapter, fresh water essentially equates to life, especially in the Middle East and Africa. PLO leader Yasser Arafat already highlighted the potential for fresh water to escalate from a national to a regional issue in the Middle East. With significant U.S.

national security interests still centered in the Middle East, any regional conflict in that area will certainly become of major concern to the U.S. and most other fossil fuel using nations.

National conflict in Africa, due in part to a lack of fresh water, has already escalated into the inter-regional arena, where the U.S. and many other nations entered into Somalia under United Nation auspices for humanitarian purposes. The mission in Somalia has become blurred, with the military role of humanitarian assistance escalating into armed conflict. Whether it is a strategic resource in the Middle East, or a humanitarian imperative in Africa, scarcity of fresh water has a high degree of likelihood to cause not only national and regional conflicts, but also to expand into inter-regional armed conflict.

C. NUCLEAR CONTAMINATION

The potential for armed conflict resulting from stresses caused by nuclear contamination is low at every level of analysis. Instead of preparing for battle over radiation contamination, the prevailing response from all countries affected by this problem has been to provide monetary and technical assistance to solve the problem. The overt admissions by Russia concerning its radioactive contamination on land and in the oceans has elicited concern, and in recent cases raised tensions, but will not likely lead to conflict. In stark contrast to the environmental issues of deforestation and fresh water, nuclear contamination is an issue which is a basis for global aid,

more than inter-regional hostility. Although thousands of people in Russia have died because of nuclear contamination, and thousands in neighboring countries must alter their lifestyles to counter the effects of Russian nuclear contamination, the issue has not yet fostered any national, regional, or inter-regional armed conflicts. Although the problem is real, and people are dying, the immediate potential for conflict at any level remains low.

D. OVERPOPULATION

The stresses caused by increased populations, especially in the developing world, have indirectly caused many forms of armed conflict. But directly assigning overpopulation as a cause of armed conflict is very difficult. Overpopulation is certainly, on an intellectual level, one of the major causes of many armed conflicts in the developing world. It is difficult to point specifically to overpopulation as the direct cause of armed conflict, although studies already cited indicate that the link does exist. It is a distinct variable in the conflict equation.

With the population growth figures cited in Table II, it is not difficult to predict that conflicts involving factors associated to overpopulation will become more and more evident in the coming years. Economic, social, and political pressures from overpopulation are on the upswing in today's world. Overpopulation's effects and influences on national, regional, and inter-regional relationships are insidious and intricate. Armed conflict will erupt because of these subtle pressures, and, like fresh

water, the location of the conflict will determine whether or not the global audience will be affected. Although difficult to pinpoint as a cause of conflict, in this analysis, the potential for conflict resulting from overpopulation is high, and will be an issue in all conflict areas--national, regional, and inter-regional.

E. ECO-TERRORISM

Although environmental terrorism is not widespread, it seems only a matter of time before it becomes the terrorism of choice. As already discussed, eco-terrorism is an ancient concept, and is in fact occurring today without much fanfare. For example, as recently as July 1993, eco-terrorism was threatened in the ethnic conflict occurring in Bosnia-Hercegovina:

The Moslem authorities in Tuzla, NE Bosnia, have taken a suicidal decision to hold a referendum on whether or not to cause an environmental disaster in retaliation for receiving no humanitarian aid, Bosnian Serb military sources said. Before the Bosnian war, Tuzla was the center of their chemical industry, with large quantities of chlorine and other toxic chemicals still stored in its chemical plants. The vocal Moslems have on several occasions threatened to spill chlorine and cause a tremendous environmental disaster. [Ref 11:p. 15]

Although the Moslems did not carry out their threat of eco-terrorism, the concept is obviously viable. It only remains a matter of time before eco-terrorism becomes widespread. Once it does, by definition, eco-terrorism has great potential to escalate into the inter-regional arena. The potential for armed conflict as a result of eco-terrorism will depend on the terrorist's choice of environmental damage, but it is

not inconceivable that armed conflict involving inter-regional actors could be a response to significant ecological damage. The United States has already demonstrated its military resolve to retaliate against terrorism: U.S. air strikes in 1986 certainly lessened Libya's fervor for terrorism against U.S. targets.

The United States provides an ideal target for eco-terrorism. The vast majority of Americans describe themselves as environmentally concerned. [Ref. 12:p. 43] The power of organized environmental movements in the U.S., such as the Sierra Club, the Nature Conservancy, and Greenpeace, is growing at astonishing rates. The environmental lobby in Washington is one of the most powerful influences on domestic politics. The U.S. is currently experiencing a blooming of national and global environmental awareness that makes it ripe for exploitation by terrorist groups. It is likely just a matter of time before this environmental vulnerability is abused. The potential for national, regional, and inter-regional eco-terrorism to explode in the future is high. Fortunately, it has not occurred yet. Linking eco-terrorism's likelihood for occurrence, its high degree of potential for conflict, and the paucity of specific incidents as yet, results in assessing a medium potential for conflict at national, regional, and inter-regional levels.

In summary, the five major environmental issues are listed below, with respect to their potential for armed conflict as well as the areas for conflict. See Table III.

TABLE III: AREAS AND POTENTIAL FOR CONFLICT						
Environmental Issue	Area of Conflict			Potential for Conflict		
	Nat'l	Reg	Int'l	H	M	L
1. Deforestation	x	x	-	x	-	-
2. Fresh Water	x	x	x	x	-	-
3. Nuclear Contamination	x	-	-	-	-	x
4. Overpopulation	x	x	x	x	-	-
5. Eco-Terrorism	x	x	x	-	x	-

IV. ISSUE COMPARISON

In analyzing environmental issues and their potential for conflict, it is evident that there are some common elements to these disparate environmental issues. In order to gain a better understanding of these issues and their implications, Table IV represents a comparative analysis of common elements intrinsic to the selected environmental issues.

TABLE IV: COMMON ELEMENTS OF THE FIVE ENVIRONMENTAL ISSUES					
Elements	Deforest	Water	Nuclear	Pop	Eco*
National Interest	x	x	x	x	-
Regional Interest	x	x	x	x	-
Inter-regional Interest	-	-	x	-	-
Direct Human Health Risk	x	x	x	x	-
Indirect Human Health Risk	x	x	x	x	-
Air Related	x	-	x	-	-
Water Related	x	x	x	x	-
Land Related	x	x	x	x	-
Economic Causes	x	x	x	x	-
Political Causes	-	x	x	-	x
Social Causes	-	-	-	x	-
Military Causes	-	-	-	-	-
Long-Term Solution?	x	x	x	x	-
Short-Term Solution?	x	x	x	-	-
Government Sponsorship	x	x	x	-	-
Industrially Related	x	x	x	-	-
Agriculturally Related	x	x	-	-	-
Illegal	-	-	x	-	x

*Eco-terrorism estimates based on the lack of firm data on specific terrorist incidents. Each eco-terrorist episode will involve some version of assorted variables, and not others, depending upon its individual conditions. The two variables indicated here represent the only firm estimates consistent with all eco-terrorist incidents.

A. TABLE IV OPERATIONALIZATION

The following provides clarification of each of the elements listed in the above matrix. In analyzing these elements, it is important to note that this analysis assumes these elements are currently viable, that they are causing, occurring within, or influencing the environmental issue today--not some time in the future.

1. National, Regional, or Inter-regional Interest

This category assesses on what level each environmental issue is primarily focused. For example, deforestation is assessed as primarily a national and regional issue, vice an inter-regional issue. Even though the topic of forest conservation was included in the 1992 Earth Summit, the accord was non-binding. Deforestation received only passing interest at that international gathering, and was primarily a topic introduced by the United States as a method to divert attention from President Bush's refusal to sign the binding Biodiversity Treaty. [The Biodiversity Treaty was subsequently signed by President Clinton.] Conversely, because of the monetary and technical commitments of many nations, such as the U.S., Norway, Japan, and France, to improving the nuclear waste and nuclear contamination levels in the Former Soviet Union, nuclear contamination is assessed as an environmental issue which crosses every level of national, regional, and inter-regional interest.

2. Direct/Indirect Human Health Risk

Some environmental issues have not been proven scientifically to affect human health at this time. Global warming is projected to affect human health in the future if certain national behaviors are not altered. The same principle applies to the depletion of the ozone layer as well. In this particular analysis, the five specific environmental issues listed do have direct and indirect human health risks currently associated with them. Direct human health risks include loss of human habitat, such as in deforestation, or human disease caused by lack of fresh water. Indirect human health risks include radiation sickness caused by ingesting foods that have been exposed to nuclear contamination, as well as many subtle long term hazards stemming from overpopulation.

3. Air, Water, Land Related

Each environmental issue must affect at least one of these categories, by definition. The characteristics of each of the environmental degradations will determine which category is most affected. For example, deforestation affects all three elements, since burning the forests creates air pollution, cutting the forests ruins rivers and streams, and most deforesting practices ruin the land. Conversely, eco-terrorism, which can be of several types, is not depicted as related to any one specific category.

4. Economic, Political, Social, Military Causes

The economic element focuses on the monetary aspect of the environmental issue, i.e., whether this environmental degradation is being conducted for profit. The political element focuses on whether the environmental degradation is politically motivated, i.e., a power play using environmental politics. The only social element identified in environmental degradation is associated with overpopulation. Family size, abortion, and birth control are all primarily social issues, which contribute to overpopulation, which can lead to environmental degradation. Military causes of environmental degradation are making national and international headlines, especially with U.S. base closures around the world. But in this analysis, the military is not a primary cause of the five selected environmental issues.

5. Long, or Short Term Solution?

The concepts of long and short are only nominal measures. For this analysis, a more specific definition is necessary. Long term solutions are defined as solutions realized in five years or more, and short term solutions are realized in less than five years. In assessing whether these environmental issues have long or short term solutions, the comparison assumes that a solution does exist today. Political or social will remains outside the scope of this category. For example, overpopulation will not be solved within five years, even if the overpopulated nations were able to find the will today to limit family size. Conversely, fresh water can be provided to all

nations within five years--the solutions exist to this environmental problem, whether or not the political or social will is forthcoming.

6. Government Sponsorship

Some environmental degradation issues can be traced to poor environmental management, by inadvertent oversight, deliberate neglect, or by sheer ignorance. Another reason for environmental degradation can be attributed to government sponsorship, i.e., a nation's government knowingly participates in the environmental degradation with a reasonable understanding of the environmental consequences. For example, deforestation is being conducted by the Brazilian government for economic and political reasons. Overpopulation, on the other hand, cannot be generally labeled as a government-sponsored environmental hazard, although in some countries governmental neglect could be construed as passive sponsorship of overpopulation. In this thesis, active governmental sponsorship is the criterion for applicability to a specific environmental issue.

7. Industrially or Agriculturally Related

Some environmental degradation issues are caused more by industry than agriculture, and vice versa. For example, nuclear contamination is not primarily related to agriculture, although it is inextricably linked to industry. Deforestation is primarily an agriculturally-related environmental issue, and eco-terrorism cannot be attributed to either element--until it actually occurs.

8. Illegal

Some environmental degradation is completely legal, by domestic and/or international law. Other environmental degradation is also completely illegal. For example, there are no international laws restricting deforestation practices within the countries which employ such forestry methods. True, the U.S. does have considerable domestic laws which restrict its own forestry industry, but the U.S. (for the most part) is not harvesting its timber illegally, nor at the incredible rates which have thrust Asian and South American nations into the environmental spotlight. Nuclear contamination is, however, illegal--especially at the levels that the Russian Federation revealed in its White Paper.

B. WHAT TABLE IV REVEALS

The following represents an examination of which common elements apply to each of the selected environmental issues.

1. Deforestation

This environmental issue spans two of the three levels of nation-state's interests. Deforestation is certainly a national interest, whether that nation either supports or condemns the practice. Because of the far reaching nature of the environmental degradation associated with deforestation, it reaches beyond national boundaries, and quickly enters into the regional sphere. As already discussed,

deforestation has received little more than "lip service" in the international/inter-regional arena.

Deforestation encompasses both direct and indirect human health risks. Direct human health risks include destruction of native habitats in the Amazon region, as well as the fouling of fresh water streams and rivers. Indirect human health risks include destruction of the forest's eco-systems, which results in subsequent unsustainable agriculture production.

Deforestation also has links to air, water, and land issues. The mechanics of deforestation include burning of the unused forest products, which contributes to air pollution. Fresh water is often spoiled due to deforestation, and, as discussed, lands are often despoiled for continued agricultural usage.

Deforestation is primarily an economic issue. Country after country engages in massive deforestation, claiming that they must cut their forests in order to feed their people. Brazil, desperately poor, believes it must cut its forests to remain economically viable.

The problems associated with deforestation have both long and short term solutions. Of course, both solutions feature incorporating sustainable forestry practices, including selective cutting and re-seeding of forest tracts. These solutions can be accomplished within five years. The trick is to convince economically strapped governments to embrace sustainable practices, and to accept that products and

revenues from robust forests are economically more lucrative in the long term than acres of destroyed lands.

In countries throughout the world, mass deforestation is nationally sponsored. Even in the United States, the governmental agencies (Department of the Interior, National Forest Service, Department of Agriculture) which are specifically tasked with protecting and managing the national forests, are also responsible for promoting timber sales.

Deforestation has links to both agriculture and industry. Agriculture essentially grows the forests, while industry produces the products made from those forests. In best case situations, both elements cooperate.

Deforestation is completely legal throughout the world. Even in the U.S., the nation's forests are logged only under the auspices of the federal courts. In the lesser developed nations, federal courts rarely enter into the realm of deforestation.

2. Fresh Water

Clean water, like deforestation, spans two of the three nation-state's levels of interests. Fresh water is certainly of national and regional interest, as evidenced by the examples from the Middle East and Africa. But, like deforestation, fresh water has not yet become an interest at the inter-regional level. Given the potential for conflict, this casual inter-regional interest has potential consequence to escalate quickly into inter-regional tension.

Again, like deforestation, fresh water distinctly affects human health both directly and indirectly. Disease and death are the ultimate results to human health stemming from a lack of fresh water. Indirectly, fresh water can affect human health by significantly reducing agricultural yields, resulting in famine.

Fresh water, as expected, is primarily related to the water category. Land use is also affected by a lack of fresh water. Land management is often directly related to water management practices. Air receives little impact due to the lack of fresh water.

The lack of fresh water is primarily due to economic and political causes. Social and military causes can have an impact in this category. Economic causes of the lack of fresh water are related to the water source's carrying capacity. This can be defined as the number of people that the fresh water source can support without irreversibly reducing its capacity to support people in the future. [Ref. 6:p. 157] Essentially, there is only a finite amount of fresh water in the earth's water cycle that is available for consumption. With increasing demands upon this finite amount, due to increased population and agricultural needs, the total amount of fresh water available must be spread over a greater and greater field of users. Therefore, the total amount for each user is reduced accordingly. Fresh water's carrying capacity is being tested severely by economic demands. Additionally, political influences are also affecting the availability of fresh water. As already discussed, the Anatolia Dam Project in Turkey,

with its 38 dams and irrigation projects, will significantly affect the fresh water supplies of Turkey's downstream neighbors: Syria and Iraq. Political and potentially military influences will certainly play a key role in determining how much water Turkey will use, and how much will be allowed to quench Syria's and Iraq's thirsts.

Short and long term solutions to the lack of fresh water do exist, but they entail agricultural sacrifices which may not be acceptable to arid nations. Short term solutions, achieved in less than five years, include better managed agricultural practices which reduce water waste. Long term solutions include developing agricultural products which require less water for production. Another long term solution is to expand the amounts of usable water in the earth's finite cycle. This can be achieved by improving the process of extracting fresh water from sea water. Either the demands upon fresh water portion of the earth's water cycle must be reduced, or the amount of fresh water must be increased by tapping into the saltwater portion of the water cycle.

Government sponsorship in the fresh water issue is manifested by state involvement in national dam and irrigation projects. Major dam projects, such as Turkey's Anatolia Project, receive substantial funding from host governments, and can be affected by international financing schemes.

Both industry and agriculture place great demands on fresh water.

Industry uses fresh water for a myriad of uses, and fresh water is absolutely essential for growing any type of agricultural crops.

The use, or overuse, of fresh water in this context is not illegal. Controls are placed on fresh water usage, as in the U.S., but the majority of users of fresh water in the world do so without legal interference.

3. Nuclear Contamination

Radioactive contamination has the attention of the world. With the revelations contained in Russia's White Paper, international organizations have been conducting various research projects in order to assess the environmental damage due to ocean dumping of high- and low- level radioactive waste. International aid has been promised, and some actually delivered, to assist in clean-up as well as in the construction of nuclear waste storage facilities. For Russia, the case is time-urgent.

Radiation has both a direct and an indirect effect on human health. Direct effects include death or permanent physical damage from radiation poisoning, and indirect effects are realized when radiation poisoning enters the food chain.

Nuclear contamination spans the spectrum of air, water and land. Radiation can be spread through the air, it can be dumped into the oceans and rivers, and it can be poured onto the ground, with potential to significantly jeopardize underwater aquifers.

The primary causes of nuclear contamination today are due to economic and political reasons. Safe storage of nuclear waste costs more than simply dumping the waste in the oceans or on the ground. Processing of nuclear waste is another costly process, which is absolutely essential if the waste is to be stored safely in the environment. Political influences on nuclear contamination span the spectrum from complete disinterest, as in the Former Soviet Union, to over-regulation, which the U.S. is experiencing today.

The technology exists today to prevent nuclear contamination, and to store nuclear waste safely above ground. For long term solutions, sites for deep geologic repositories for long term storage are being negotiated, as well as new technologies being explored for transmutation (changing the atomic character of the radiation) and vitrification (encasing nuclear waste in stable glass for safe storage). The ultimate long term solution is to wean the world away from nuclear fission power, which produces vast amounts of nuclear waste. Additional investigations into nuclear fusion power, which, compared to fission, produces very little nuclear waste, are being conducted with slow but positive results.

Most governments in the world, including the U.S., subsidize their nuclear power industry, whether it is the commercial or military sector. The U.S. military has a robust nuclear power component, which includes nuclear aircraft carriers

and submarines. Contamination resulting from nuclear power is an acceptable risk associated with all government sponsored nuclear power industries.

Nuclear contamination is primarily an industry related environmental issue. Nuclear contamination also affects the agricultural industry, as a detriment to optimum crop production. The agricultural industry does not directly employ nor contribute to nuclear power, or to its associated nuclear contamination.

Intentional nuclear contamination is illegal. Numerous national and international regulations are in place to significantly restrict or prohibit nuclear contamination of the environment (but are not always effective).

4. Overpopulation

The stresses attributed to overpopulation are primarily restricted to the national and regional levels. One of the most publicized stresses from overpopulation is refugee flight from poverty and starvation. These particular types of refugees are predominately limited in scope to national and regional movements. Some groups of overpopulation refugees have been moving from one region to another, but generally not of the scale (yet) to pose any significant interest at the inter-regional level.

Overpopulation has both direct and indirect effects on human health. Reports from Somalia graphically demonstrate both effects that occur for years as a result of overpopulation.

Overpopulation certainly directly affects the elements of water and land, but it does not have a tangible effect on the quality of air. Overpopulation ravages the lands and depletes fresh waters. The stresses on these elements can sometimes be so devastating that it takes decades for environmental recovery.

Although overpopulation has ties to all aspects of human society, it is primarily caused by economic and social practices. Political influences and military causes remain secondary. Overpopulation can be aggravated by economic factors as a result of natural occurrences, such as drought, poor agricultural practices, or poverty. Overpopulation occurs due to various social practices, such as a lack of formal family planning education, village customs, and ancestral traditions.

Overpopulation has only a long term solution. The obvious short term solution is to reduce the numbers of people in the overpopulated region. Short term options to accomplish this reduction include genocide, mass relocation to another nation or region, and food provision. Genocide is not an acceptable solution to overpopulation. Mass migration to another area would not necessarily be welcomed by the receiving country or region. Providing food is only a very short term solution to immediate starvation, which does not solve the overpopulation problem, and which can become very costly in more than monetary ways, such as the military commitment in Somalia. Long term solutions, that is solutions beyond five years, include education and social reforms. Other forms of long term solutions to limiting overpopulation exist,

such as in China. China's methods of enforcing limits to family size, aborting female fetuses, and expansive education campaigns may not synchronize with traditional Western ideals of family planning, but it works for China.

Overpopulation cannot be attributed to government sponsorship. No government wants to be faced with the horrors of overpopulation. Neither can overpopulation be attributed to industry or agriculture. Although certainly affected, these two elements are merely victims of the phenomenon.

Overpopulation is not illegal, except in small pockets of the world. China, as already discussed, has legal restrictions on family size to prevent overpopulation. But the vast majority of the world remains free to bear as many children as desired.

5. Eco-Terrorism

This environmental issue is difficult to assess, with only a single event specifically labeled as eco-terrorism. Saddam Hussein's igniting Kuwait's oil fields, and polluting the Persian Gulf with oil can be classified as the precursor event to this terrorism category. Eco-terrorism as a variety of terrorism specifically exploiting environmental targets, and additional examples of this type of terrorism loom on the horizon. Two categories can be analyzed using Hussein's eco-terrorism as a model: politically caused, and illegal. Terrorism, more often than not, is politically motivated. It is also illegal throughout the world. The other categories of analysis can easily be completed once an eco-terrorism incident occurs. Not all eco-terrorist incidents will

target all three categories of land, air and water that Hussein targeted. Dependent on the method and the target, eco-terrorism will span one or all categories.

V. THE U.S. MILITARY VS. THE ENVIRONMENTAL ISSUES

Since national, regional, and international security issues now encompass environmental concerns, can the U.S. military address the environmental issues discussed in this paper? If so, how?

To better analyze the U.S. military with regard to these five environmental issues, it is worthwhile to review the changing roles of the military. Since the end of the Cold War, U.S. military planners have had to face the greatest foe of all--uncertainty. Be it Somali warlords, Bosnian Serbs, or the U.S. Congressional Armed Services Committee, the U.S. military has had to face an abundance of unpredictable foes. So far, the U.S. military has not met all such foes with impunity, and some military members have paid the ultimate price.

The uncertainty of the military's foe has been compounded by the uncertainty of military roles and missions in today's world. No longer is the U.S. military focused on defending the U.S. against the Russian bear. Today's foes are embodied in drug boats from South America; in Somali thugs riding rusty jeeps committing acts of mayhem; in former Yugoslavian teenagers carrying surface-to-air weapons; and in domestically-driven Congressional budgets threatening to squeeze the military's capabilities below their capacity to function effectively. The U.S. military, feeling the

threat from all sides, must now also face the potential security threat caused by environmental degradation.

It is not surprising that the U.S. military appears to resist the notion of defending national security by applying its skills to areas which appear to take time and energy away from traditional warfighting roles. Security threats from environmental issues have not been traditional areas of concern for the military, and this lack of knowledge has created a lethargy. With so much uncertainty surrounding the U.S. military today, it is no wonder the environment remains far down the list of military priorities.

But this is changing. Faced with astounding financial burdens to clean-up environmental pollution, as well as a maze of legal requirements resulting from environmental legislation, the U.S. military is quickly becoming proficient in this new mission. In fact, the U.S. Congress has directed Navy Secretary Dalton to establish Environmental Naval officers at all key Navy commands. [Ref. 13:p. 3] Just as in the 1970s, when the U.S. military attacked the problem of drugs in the ranks, it is now attacking the problems resulting from lax stewardship of the environment.

A. MILITARY ROLES AND MISSIONS

Historically, military roles have centered around the use of arms to enforce or coerce some form of behavior. This role is still alive and well in today's military. The

use of armed force will always remain the mainstay of any military, since armed force is the fundamental reason for organizing and supporting a military.

But, as General Colin L. Powell, Chairman of the Joint Chiefs of Staff, wrote in his February 1993 Report on the Roles, Missions, and Functions of the Armed Forces of the United States:

More changes have occurred in the U.S. military during the last three years than in any similar period since the National Security Act of 1947. Three key factors--the end of the Cold War, increased budgetary constraints, and a revised Title X of the U.S. Code which incorporates Goldwater-Nichols legislation [i.e., jointness]--have converged to provide the opportunity, necessity, and license to make changes." [Ref. 1:p. II-1]

It is common to confuse the two concepts of roles and missions. As previously discussed, for this analysis, roles and missions are distinctly different in definition. Roles refer to deeds or actions the military is capable of performing. To put it simply, roles can be defined as action verbs--something that is performed. In contrast, missions are specific jobs assigned to the military, where the military employs a specific role toward achieving that mission. Put succinctly, the U.S. military performs a role to accomplish a mission.

In order to assess whether or not the U.S. military is capable of assuming an additional mission directed against some form of environmental degradation, a review of ten current U.S. military roles and their applications in three current U.S. military missions follows.

1. TEN U.S. MILITARY ROLES

a. Communications

One of the strongest attributes of the U.S. military is its extensive communications capability. Although not without some problems, as highlighted in the Persian Gulf War, military communications networks are among the best of U.S. military capabilities.

b. Interdiction

A major role for the military involves prohibition of some form of behavior or action by interceding. The U.S. military is called upon to perform this type of role most often in today's world. Conflicting goals in the peacekeeping mission in Somalia result from a humanitarian mission which has degenerated from an assistance role into an interdiction role--i.e., protecting the food supplies from the raiding Somalian warlords.

c. Enforcement

Compelling obedience is a role closely related to the interdiction role, but it still remains somewhat different. Counterdrug operations could be classified as a mission employing an enforcement role, i.e., enforcing national laws against drug trafficking. The U.S. military role of enforcement is complementary to the very non-traditional military mission of counterdrug operations.

d. Education and Training

One of the little publicized roles of the U.S. military is education. Throughout the world, U.S. military personnel are being used as instructors in public schools. One mission employing this role is the Navy Personal Excellence Partnership Program, where military members are providing technical expertise in public schools on a full range of subjects. [Ref 14]

e. Assistance

Humanitarian assistance has become a major role for the U.S. military. Somalia and Bangladesh are recent examples of such international military missions, where the U.S. military performed in the role of assistance, rather than warfighting. Global media coverage relished in transmitting pictures of U.S. military men, dressed for war, presenting food to the starving children in Somalia and flood victims in Bangladesh. Additionally, disaster relief offers also another spin on the assistance role. The U.S. military was called upon to provide assistance on the domestic front after hurricanes Hugo and Iniki devastated south Florida and the Hawaiian Island of Kauai. And, as this is written, the U.S. military remains prepared to enter Haiti and perform an un-mandated, unilateral assistance role.

f. Leadership

The world continuously looks to the U.S. for global leadership in both good times and bad. The U.N. is well known for turning to U.S. military leadership when any coalition is formed to deal with an international crisis.

g. Warfighting

The number one role for the U.S. military is, and always must be, warfighting. Whether it is in the Middle East, or Korea, the U.S. military's primary role is warfighting. Recently, MOOTWA (Multilateral Operations Other Than Warfighting) and its impact on military warfighting has become a major concern for U.S. military planners. MOOTWA missions, such as humanitarian assistance and disaster relief, are beginning to form a significant portion of U.S. military operations. It is unknown what specific type of impact these missions will have on overall U.S. military warfighting capabilities, but concern exists that new emphasis on MOOTWA could undercut training and readiness for primary warfighting roles and missions.

h. Surveillance

This key U.S. military role is the bedrock for any successful mission. The role of surveillance is used very extensively in counterdrug and counterproliferation missions currently underway in the U.S. military. With wide-ranging assets for surveillance in all areas, be it electronic, human observation, sonar, radar, or space-based, the U.S. military is well equipped to perform many missions employing its role of surveillance.

i. Intelligence

The gathering, interpretation, and dissemination of intelligence information is another key role for the U.S. military. Without intelligence, success in any U.S. military mission would be in doubt.

J. Deterrence

Most traditional roles of the U.S. military have been retained despite the ending of the Cold War. Deterrence, a major U.S. military role for decades, is still a leading role today, although it is being altered to conform to today's new missions. Since 06 August 1945, deterrence has mainly been interpreted as a role ascribed to nuclear forces. The creation of the U.S. Strategic Command (USSTRATCOM) was a fundamental shift in the approach to nuclear weapons control. As General Powell stated:

For the first time in our history, all of America's strategic nuclear weapons are consolidated under one combatant CINC. Command of all strategic bombers, missiles, and submarines will alternate between an Air Force general and a Navy admiral--an arrangement hard to imagine only a few years ago. This consolidation of the forces that truly do safeguard our way of life is perhaps the most dramatic and fundamental change in the assignment of roles and missions among the Armed Services of the United States since they first were established by law in 1947. [Ref. 1:p. II-3]

In addition to consolidation of command functions, there has also been a fundamental change in the numbers and make-up of the U.S. nuclear arsenal. The Army and Marine Corps no longer have nuclear weapons, and now rely on the Air Force and the Navy for nuclear support. Aircraft carriers, surface ships, attack submarines and land-based naval aircraft no longer carry tactical nuclear weapons.²

² However, some naval nuclear weapons, such as TLAM-N, are retained in storage against the prospect that in the future, their renewed forward deployment might be warranted. Additionally, a number of air launched theater weapons remain available, principally in Europe.

All U.S. strategic bombers have been taken off alert. Our entire world-wide inventory of ground-launched, short-range tactical and theater nuclear weapons, including nuclear artillery shells and short-range nuclear ballistic missile warheads, has been withdrawn and is being eliminated. [Ref. 1:p. II-4] By the year 2000, an estimated seventy percent of the U.S. nuclear arsenal will be eliminated. These fundamental changes represent a major shift in the traditional U.S. military role of deterrence transforming the very essence of the U.S. military. Although in a significant transition of forces, the U.S. military will continue to use deterrence as one of its most important roles. Deterrence will continue to be supported by the U.S. military through the use of precision strike, conventional means.

2. Three U.S. Military Missions

a. Counter-Drug Operations

One of the most unusual non-traditional missions assigned to the U.S. military has been its counter-drug operations. Shouldering this additional responsibility in 1989, the military applied its role of detection and monitoring support to assist in curtailing the aerial and maritime flow of illegal drugs into the United States. Counter-drug operations also employ another minor role that the U.S. military does very well--coordination of simultaneous or consecutive events. This role has been utilized to its fullest during this ongoing mission by conducting joint and combined operations with various forces, such as U.S. military reserve forces, the U.S. Coast Guard, coalition service branches, border patrol forces, and U.S. Customs.

b. Peacekeeping

Peacekeeping, which incorporates and combines elements of many different U.S. military roles, is receiving ever greater mission emphasis. Today, a peacekeeping mission is more than likely conducted by a U.N. coalition force far from U.S. shores, such as in Macedonia, Lebanon, Kashmir, Cyprus and Cambodia. There is a newly emerging strategy for U.S. military peacekeeping missions, as a direct result of the difficult problems associated with ethnic strife and low intensity conflict. This strategy focuses on three specific military roles which the U.S. military does particularly well: planning, training, and direct participation.

In U.N. Peacekeeping missions, U.S. troops are heavily involved in the planning aspects, since the infrastructure of U.S. planning is already well established. The U.N. is only now beginning to design its own military coordination and planning infrastructure. Training for conflicts resulting from ethnic strife is a new type of role for the U.S. military, steeped for decades in its Cold War garrison traditions. The direct participation aspect of this Peacekeeping role involves many angles, ranging in spectrum from intercession to logistical support. As can be seen in Somalia, the lines between the roles of direct participation and intercession can become blurred. With NATO's new focus in today's Post Cold War world--i.e., low intensity peacekeeping missions, and full scale engagement/high intensity combat--the various U.S. military roles performed in peacekeeping missions can only become more diffused. Direct participation does not encompass only the action of intercession,

which has a faintly negative connotation to it. Direct participation by U.S. forces can also mean employing the U.S. military's extensive logistics capabilities, as well as communications networks, and surveillance assets. Whatever roles the U.S. military plays, or capabilities it employs, in a Peacekeeping mission, chances are that the mission will be accomplished more efficiently simply because of the U.S. military's direct participation.

c. Humanitarian Assistance

Humanitarian assistance has developed into a primary mission for U.S. armed force. In its beginning, the U.N. mission in Somalia was labeled as humanitarian assistance. This mission employed several U.S. roles, such as leadership, communications, surveillance, and interdiction. The Somalian mission since has changed into one of peacekeeping, where a different set of U.S. military roles have been employed, including warfighting, enforcement, deterrence. Within the United States, humanitarian assistance missions have been focused on disaster relief stemming from earthquakes, floods, and storms, utilizing a different set of U.S. military roles, such as communications, education, logistics, engineering, assistance, and leadership.

VI. NATIONAL SECURITY STRATEGY AND THE ENVIRONMENT

In January 1993, President George Bush published his National Security Strategy of the United States. For the first time in U.S. history, the natural environment was discussed as a national interest. President Bush stated:

Environmental degradation is one of the most pressing global problems. Deforestation, climate change, air and water pollution, and depletion of water supplies have far-reaching effects on the capacity of countries to sustain economic growth and ensure a healthy environment for their citizens. Environmental problems transcend national boundaries. Air and water pollution in one country can affect far distant countries as well as those nearby. Some problems, such as ozone depletion and climate change, can have a global impact. In many developing countries, environmental degradation is already causing serious health problems and limiting economic development.

Addressing these environmental issues requires a global effort. The United States has established some of the strictest environmental standards in the world, and we need to live up to them. However, we are not immune to the effects of environmental degradation elsewhere. The United States is already playing an active role in supporting multinational environmental programs, population control initiatives, and research on global problems. We will continue to advance international cooperation on environmental issues and support this effort with adequate funding. We especially need to ensure that environmental concerns are integrated fully into our

overall economic and trade policies. Economic growth and environmental protection can be made complementary objectives to be pursued together. [Ref. 2:pp. 11-12]

Although President Clinton has not specifically linked the environment with national security, he and his administration have linked a healthy environment to national economic strength.³

A. U.S. MILITARY STRATEGY AND THE ENVIRONMENT

In 1992, General Powell published The National Military Strategy. In that document, General Powell listed four National Interests and Objectives in the 1990s.

They are:

- 1) The survival of the U.S. as a free and independent nation
- 2) A healthy and growing U.S. economy
- 3) Healthy, cooperative and politically vigorous relations with allies and friendly nations
- 4) A stable and secure world, where political and economic freedom, human rights, and democratic institutions flourish. [Ref. 15:p. 5]

General Powell also identified the fundamental objective of the armed forces: to deter aggression, and, should deterrence fail, to defend the nation's vital interests against any potential foe. The fundamental U.S. military concepts supporting this

³ President Clinton signed the much debated Biodiversity Treaty, only when side agreements were met which lessened the economic restrictions on American businesses. President Clinton also created the Office of Environmental Security, headed by an Under Secretary of Defense. And the most recent example of the linkage between national (economic) security and the environment is President Clinton's signing of the North American Free Trade Agreement (NAFTA), which also includes side agreements to support environmental laws in both the United States and in Mexico.

strategy include Strategic Deterrence and Defense, Forward Presence, Crisis Response, and Reconstitution. Although Reconstitution has received little emphasis in today's political arena, the other three foundations remain stable, and rely heavily on the various roles of the U.S. military.

General Powell did not include the environment by name in his discussion of military strategy. Military environmental strategy is a concept yet to be developed, or even conceived. By comparing President Bush's National Security Strategy, and General Powell's Military Strategy, it is evident that in order for the nation to fulfill the President's National Security Strategy, it must employ General Powell's Military Strategy. Therefore, in order to address the stated presidential priority of the environment, the military must be prepared to fulfill whatever environmentally-focused mission it is assigned. When faced with fulfilling similar expanded missions, such as counterdrug operations, peacekeeping, or humanitarian assistance, the U.S. military adapted its impressive inventory of roles to perform these unfamiliar missions. General Powell's Crisis Response and Forward Presence strategies have been routinely incorporated into such unfamiliar missions, with largely successful results.

General Powell also listed a growing and vibrant economy as a national security interest. In President Bush's National Security Strategy, the President inextricably linked a healthy and vibrant environment with the nation's economic growth. President Bush was confident that both objectives could be pursued simultaneously. Although General Powell published his 1992 National Military Strategy prior to President Bush's

1993 National Security Strategy, the new national economic mission of environmental security can be viewed as simply another non-traditional military mission, to be fulfilled using traditional military roles. When first faced with the mission of counter-drug operations, the military adapted readily to the new requirements necessary for conducting that surveillance and support mission. The new mission of peacekeeping is continually adapting, as new areas and types of conflict develop throughout the world.

The U.S. military has devoted considerable time and energy to cultivate the skills and talents required to perform the spectrum of missions it faces. Its strongest attribute, as exhibited in the 1990s, is its ability to adapt to many changing circumstances and priorities. In assessing the U.S. military's role in an impending national or international environmental mission, the U.S. military will be expected to perform this very non-traditional mission using its familiar roles. Additionally, the U.S. military may have to develop entirely new roles to fit the unfamiliar situations in which it finds itself.

B. U.S. MILITARY ROLES AND THE ENVIRONMENT

The following paragraphs provide a brief review of the five selected environmental issues, as well as providing a comparison of U.S. military roles and the environmental issues.

1. Environmental Issue Summary

In order to carefully investigate if and how the U.S. military might apply its roles in an environmental security mission, it seems useful to compare the five designated environmental issues against the ten U.S. military roles. As a quick review, a brief summary of each of the thesis environmental issues with respect to their elements follows:

a. Deforestation

This issue is primarily of national and regional interest; poses direct and indirect human health risks; spanning air, water and land concerns; primarily economically caused; having both long and short term solutions; government sponsored; and is not illegal.

b. Fresh Water

This issue is primarily of national and regional interest; poses direct and indirect human health risks; primarily water and land related; having economic and political causes; possessing both long and short term solutions; receiving government sponsorship; related to both agriculture and industry; and is not illegal.

c. Nuclear Contamination

This issue spans all levels of national, regional and inter-regional interest; poses direct and indirect human health risks; related to air, water, and land; primarily caused by economic and political factors; possesses both long and short term solutions; receives government sponsorship; primarily industrially related; and is illegal.

d. Overpopulation

This issue primarily of national and regional interest; poses direct and indirect human health risks; primarily affects water and land; caused by economic and social factors; has only a long term solution; is not governmental sponsored; no strong relations with industry or agriculture; is not illegal.

e. Eco-Terrorism

Due to the paucity of specific incidents, two universal elements of terrorism apply to this category at this time--politically caused, and illegal.

2. U.S. Military Roles Compared

The following is a listing of each U.S. military role, compared to the elements of each environmental issue:

a. Communications

A primary role of the U.S. military in any objective, communications provide the linkages in support of a specific mission, or the linkages which connect the performance of various roles. Communications in support of

combatting each environmental issue would play a key role, whether it was an ancillary or a primary role for the U.S. military.

b. Interdiction

Certainly, if tasked to become involved internationally in these environmental issues, the U.S. military can readily perform an interdiction, or prohibitive, role. If the environmental consequences of deforestation, lack of fresh water, nuclear contamination, and eco-terrorism, escalated up to the inter-regional level, the U.S. military could probably become involved in the prevention of some behavior. The only environmental issue for which U.S. military interdiction would not be used is in the area of overpopulation. Given the morality and fundamental principles of the American people, the U.S. military would be seen as powerless to perform an interdiction role concerning overpopulation.

c. Enforcement

Similar to the interdiction role, the U.S. military could readily perform an enforcement role in environmental issues, if these issues escalated into the inter-regional arena. Enforcement of national, or international laws, is a role the U.S. military is performing today. The role of the U.S. military as the "World's Policeman" has received many columns of ink in global academia. The only environmental area where enforcement would not be a role for the U.S. military is, like interdiction, in the issue of overpopulation. The U.S. military is not in the business of enforcing population laws.

d. Education and Training

The U.S. military is not equipped to provide education and training on the prevention of deforestation, the use of fresh water, overpopulation, nor on eco-terrorism. In particular, deforestation, fresh water, and overpopulation are completely outside the scope of current U.S. military training expertise. The U.S. Army Corps of Engineers is heavily involved in the management of waterways, rivers, dams, and recreation areas, and may be able to transfer its expertise to this area. [Ref 16]

Eco-terrorism also provides a difficult situation for the U.S. military. Although well versed in "regular" terrorism, the potentially expanded, and unknown consequences of eco-terrorism are issues in which the U.S. military does not provide education and training at this time. Terrorism directed specifically against the environment is vastly different from terrorism directed against people. Each situation would differ from the other, and would require the flexibility of an ad hoc response--a capability for which the U.S. military is well-known.

Nuclear contamination provides one issue in which U.S. military education and training can apply. The U.S. Navy is especially well versed on nuclear power issues, but does itself have some political and technical difficulties in disposing of nuclear waste. However, Admiral Bruce DeMars, Director of Naval Nuclear Propulsion, stated before Congress in 1990 that the U.S. Navy boasts a superb safety and environmental record. [Ref. 17:p. 14] This type of experience could be tapped in

order to mitigate the dangerous circumstances attributed to nuclear contamination by other countries.

e. Assistance

The U.S. military is capable of providing humanitarian assistance across the range of environmental issues. Humanitarian assistance is a role which can be applied to essentially any type of conflict, depending on the political will of the U.S. leadership. Even in eco-terrorism, the U.S. military can be called upon to assist the victims, or even aid in the environmental clean-up.

f. Leadership

The U.S. military role of leadership also applies to all categories. No matter what the conflict, the U.S. military routinely has been asked to provide leadership. Whether the conflict involves starvation in Somalia, ethnic strife in Bosnia, or deforestation in the Amazon, the U.S. is uniquely regarded and capable of fulfilling any leadership role.

g. Warfighting

The likelihood that the U.S. military would be asked to fulfill a warfighting role in one of these environmental issues is remote. Going to war, requiring the support of the U.S. Congress and of the American people, asking our armed forces to sacrifice because of deforestation or fresh water, is not in today's circumstances very probable. The one issue in which the U.S. military might engage in warfighting is eco-terrorism. Dependent on the eco-terrorism circumstances, the

U.S. warfighting role could be either one of low intensity, or it could even encompass full scale combat.

h. Surveillance

The U.S. military is immensely capable of providing world-wide surveillance on most environmental issues. Similar to how surveillance is used in another non-traditional mission, counter-drug operations, the U.S. military could readily employ this role against many international environmental degradations. By utilizing airborne and space-based reconnaissance platforms, the U.S. military can achieve a global view of many environmental issues.

i. Intelligence

Also similar to the surveillance role, the U.S. military intelligence network could be applied to these environmental issues as well. The U.S. military's capabilities in intelligence gathering and interpretation is superb, and could naturally be focused on gaining information to combat dangers evolving from all five environmental issues.

j. Deterrence

The U.S. military could readily perform a deterrence role against four of these environmental issues. U.S. Navy armadas blockading a deforesting nation's coastlines, U.S. Air Force overflights targeting dam construction, or U.S. Army counter-terrorist exercises could arguably send a viable deterrence message. The one issue which remains outside the scope of U.S. military deterrence is

overpopulation. The U.S. military is not empowered to provide an effective deterrent message against overpopulation.

Table V provides a summary of which U.S. military roles can be applied to the selected environmental issues:

TABLE V: U.S. MILITARY ROLES VS. ENVIRONMENTAL ISSUES					
Role	Deforest	Water	NucCon	Pop	Eco-Terror
Communications	x	x	x	x	x
Interdiction	x	x	x	-	x
Enforcement	x	x	x	-	x
Education & Training	-	-	x	-	-
Assistance	x	x	x	x	x
Leadership	x	x	x	x	x
Warfighting	-	-	-	-	x
Surveillance	x	x	x	x	x
Intelligence	x	x	x	x	x
Deterrence	x	x	x	-	x

VII. CONCLUSION

In examining Table V, it becomes clear that five of the ten military roles apply to all of the selected environmental issues. Those roles are communications, assistance, leadership, surveillance, and intelligence. The five remaining military roles which can apply to some of the environmental issues are interdiction, enforcement, education and training, warfighting and deterrence.

The five roles which universally apply (communications, assistance, leadership, surveillance, and intelligence) have a common theme to them. They are what could be termed as support roles, i.e., roles which the U.S. military performs in order to strengthen a primary role or mission. These particular roles are the basic subset, or precursor, to any mission given the U.S. military, whether it be counter-drug operations, peacekeeping in Somalia, or disaster relief in Florida.

The one U.S. military role which today applies to only a single environmental issue is education and training. The U.S. military was not designed nor empowered to provide education and training to others as a primary role or mission. The vast majority of the education and training that does occur in the U.S. military is primarily for the U.S. military, intended to provide a better fighting force. The environmental issue in which the U.S. military can now apply its education and training is in the

prevention of nuclear contamination. Because of the extensive nuclear propulsion program in the U.S. Navy, the prevention of nuclear contamination is a major consideration for the U.S. military. The spectrum of the U.S. military's knowledge on nuclear contamination is limited, however, since the safe disposal of nuclear waste is the responsibility of the Department of Energy. The U.S. military is technically competent on the safe use of nuclear power, and on the prevention of nuclear contamination. It is not, however, the expert on the safe, long term storage of nuclear waste.

Four of the remaining five roles which do not universally apply to all of the environmental issues (interdiction, enforcement, warfighting, deterrence) are essentially U.S. military roles which employ force, or the threat of force. Warfighting, the very essence of the primary U.S. military role, only applies directly to the eco-terrorism issue. This is not surprising, however, since terrorism is a form of warfare.

Interdiction, enforcement, and deterrence could apply to all environmental issues except overpopulation. Use of force could be applied to preventing or reacting to deforestation, nuclear contamination and eco-terrorism, as well as to problems with fresh water usage. But, U.S. military force is not applicable to overpopulation. The cynics may offer that military force also is a useful tool to use to de-populate a nation; such options range from the neutron bomb to genocide campaigns conducted by military and para-military operations in the former Yugoslavia. However, the current

political and moral character of the United States would not allow the U.S. military to be used in such a manner.

Examining Table V from a different perspective, the environmental issues which appear most amenable to a U.S. military role are nuclear contamination and eco-terrorism. As discussed above, the U.S. military is well-versed in the prevention of nuclear contamination. It is a role which the U.S. Navy has mastered for four decades.⁴ Eco-terrorism is also an environmental issue which the U.S. military is able to address, since response to terrorism is closely related to warfare.

The next set of environmental issues which may be amenable to a military solution is deforestation and fresh water. These two issues have eight roles which apply to each, consisting of both use of force roles and support roles. Depending upon the circumstances of the environmental threat, the U.S. military might have a role to play in deforestation and fresh water disputes.

The U.S. military has only support roles to fulfill in the environmental issue of overpopulation. Use of force roles do not apply to this issue.

In summary, the U.S. military can play some role in all of the selected environmental issues. Upon further examination, it becomes clear that U.S. military roles can be categorized as support and as use of force roles, and that each of these roles can be applied in various combinations to the environmental issues. The issues

⁴ The first nuclear submarine, the USS Nautilus, was launched in 1954.

of nuclear contamination and eco-terrorism are most amenable to U.S. military roles, since they are issues which can accommodate both support and use of force roles. Deforestation and fresh water are environmental issues which are amenable to all U.S. military roles, except education and training, and warfighting. Overpopulation is an environmental issue which is only amenable to U.S. military support roles. In order to make the U.S. military better prepared for the eventuality of being assigned an environmental security mission, military planners must, first and foremost, take the environmental security mission seriously. Acceptance of the validity and worth of such environmental missions would signify a distinctive shift in military priorities. By including environmental conflict as a potential area for U.S. military involvement, the scope of military missions would widen drastically. As discussed earlier, a parallel trend has already begun with growth the new concept entitled "Multilateral Operations Other Than War," or MOOTWA. Difficulties associated with MOOTWA center on the threat of essentially "emasculating" the U.S. military by assigning missions emphasizing skills far different from warfighting. MOOTWA missions are often viewed as taskings which may dilute warfare training, and therefore negatively impacting on military readiness for combat. In this context, both the support and use of force missions in potential environmental conflicts might be closer to the U.S. military primary combat roles than other MOOTWA distractions, such as U.S. military air drops of food into Bosnia, or disaster relief for Florida.

This thesis illustrates that the U.S. military possesses the requisite skills necessary to play more than a warfighting role in an environmental conflict. Indeed, even though warfighting is the U.S. military's primary role, it is the one role which is probably the least used, except in training. The U.S. military applies the six selected support roles (communications, education and training, assistance, leadership, surveillance, intelligence) on a far grander scale than it does the four selected use of force roles (interdiction, enforcement, warfighting, deterrence). The six support roles are used by the U.S. military on a daily basis, while the training-intensive use of force roles may be used only on specific missions.

By expanding the scope of potential U.S. military missions to include environmental security issues, the U.S. military will become better prepared to meet this unfamiliar challenge. The new Naval and Joint Military Doctrine Commands, in Norfolk, Virginia, have been established to sort through the maze of problems associated with the post Cold War world, and develop naval and joint U.S. military warfighting doctrine applicable to any potential enemy. Part of their mandate should be to consider the eventuality of the U.S. military responding to an environmental security mission.

The lessons already learned from non-traditional missions, such as counter-drug operations and humanitarian assistance, should be considered as precursors to developing a new U.S. military philosophy which encompasses more than warfighting. With fewer troops in the U.S. military, and a more diffuse security environment, the

U.S. military cannot afford to simply rely on "ad hoc" approaches to non-traditional missions. It is clearly possible that the term of "non-traditional" missions is in fact obsolete, and that the traditional concept of World War II style "grand warfare" is no longer probable. The U.S. military, and especially its strategic planners, must address the reality of environmental security as a future mission area. By using the same skills so familiar in planning for conflict during the Cold War, and applying them to the new challenges of environmental security, the U.S. military can be prepared when called upon to respond to this new threat.

LIST OF REFERENCES

1. Powell, C.L., Report on the Roles, Missions and Functions of the Armed Forces, Department of Defense, February 1993.
2. Bush, G., President, National Security Strategy of the United States, January 1993.
3. World Resources Institute, The 1993 Information Please Environmental Almanac, Houghton Mifflin, 1993.
4. "Accords for Nature's Sake," The New York Times, 15 Jun 1992.
5. Sioli, H., "The Effects of Deforestation in Amazonia," Change in the Amazon Basin: Man's Impact on Forests and Rivers, v. 1.
6. Myers, N., Ultimate Security, The Environmental Basis of Political Security, W.W. Norton & Company, 1993.
7. The White Paper, "Facts and Problems Related to the Dumping of Radioactive Waste in the Seas Surrounding the Territory of the Russian Federation," released by the Administration of the President of the Russian Federation, Moscow, 1993. Translated from Russian by Greenpeace Russia, April, 1993.
8. Arnold, D., "Scientists Say Soviet Nuke Dumping Is No Threat," We, 26 July-08 August 1993.
9. Handler, J., "No Sleep in the Deep For Russian Subs," The Bulletin of the Atomic Scientists, April 1993.
10. Director, Intelligence Research Paper, "The Youth Bulge: A Link Between Demography and Instability," Central Intelligence Agency, March 1986.
11. Foreign Broadcast Information Service, JPRS-TEN-93-018, 09 July 1993.
12. The Gallup Poll Monthly, May 1992.
13. Pexton, P., "Is It Vital or Is It Pork? It's Hard To Tell," Navy Times, 13 September 1993.

14. "Navy Personal Excellence Partnership Program" Handbook, NAVPERS 15604A, NMPC-60, Department of the Navy, 1992.

15. Powell, C.L., General, The National Military Strategy 1992.

16. Butts, K.H., Environmental Security: What is DOD's Role?, Strategic Studies Institute, U.S. Army War College, 28 May 1993.

17. Hearing on National Defense Authorization Act for FY 91, and Oversight of Previously Authorized Programs, before the House Committee on Armed Services, House of Representatives, 101st Congress, 2nd Session, Department of Energy Defense Nuclear Facilities Panel hearing on Naval Nuclear Propulsion Program, held March 20, 1990, U.S. Government Printing Office, 1990.

BIBLIOGRAPHY

Adelman, Kenneth L., and Augustine, Norman R. The Defense Revolution, Strategy for the Brave New World. California: Institute for Contemporary Studies, 1990.

Asian Defense Journal, "The Changing Global Strategic Environment: Issues for Asia," January 92.

Boxer, Baruch "Getting Beyond Rio," Issues in Science and Technology, Winter 1992-93.

Butts, Kent Hughes, Lieutenant Colonel, Army Strategy for Environmental Success, Strategic Studies Institute, U.S. Army War College, 01 August 1991.

Chan, Steve and Mintz, Alex, eds. Defense, Welfare, and Growth: Perspectives and Evidence, Routledge, 1992.

Committee on International Security and Arms Control. The Future of the U.S.-Soviet Nuclear Relationship, National Academy Press, 1991.

Cooley, Richard A., Congress and the Environment, University of Washington Press, 1970.

Dotto, Lydia. Planet Earth in Jeopardy, Environmental Consequences of Nuclear War, John Wiley & Sons, 1986.

Drew, Dennis M., et al. Nuclear Winter and National Security: Implications for Future Policy. Center for Aerospace Doctrine, Research, and Education, Maxwell Air Force Base, Alabama, 1986.

Eagleburger, Lawrence "Extending Assistance to Newly Emerging Democracies" US Department of State Dispatch, March 16, 1992.

Earl, Sylvia A. "Persian Gulf Pollution, Assessing the Damage One Year Later," National Geographic, February 1992.

Eberstadt, Nicholas. Foreign Aid and American Purpose, American Enterprise Institute for Public Policy Research, 1988.

Ehrlich, Paul R., et al. The Cold and the Dark, W.W. Norton & Company, 1984.

Eyre, Dana P., ed., The Army: Geostrategic Concerns and Environmental Considerations: A Conference Report, Strategic Studies Institute, U.S. Army War College, March 1992.

Gallucci, Robert L. "Disposing of Nuclear Weapons in the Former Soviet Union," US Department of State Dispatch, 10 August 1992.

George, James L. The U.S. Navy in the 1990s: Alternatives for Action, Naval Institute Press, 1992.

Ghosh, Pradip K., ed. Foreign Aid and Third World Development, Greenwood Press, 1984.

Gore, Senator Al. Earth in the Balance, Houghton Mifflin Company, 1992.

Haq, Mahbub Ul. The Poverty Curtain: Choices for the Third World, Columbia University Press, 1976.

Hearings before the Committee on Foreign Relations, U.S. Senate, 101 Congress, April 20, 1989. "International Environmental Agenda for the 101st Congress." U.S. Government Printing Office, 1989.

Henkin, Louis. How Nations Behave: Law and Foreign Policy, Columbia University Press, 1979.

Henkin, Louis, et. al. Right v. Might: International Law and the Use of Force, Council on Foreign Relations Press, 1991.

Kimball, Lee A. Forging International Agreement: Strengthening Inter-Governmental Institutions for Environment and Development. World Resources Institute, 1992.

McNeill, William H. The Global Condition, Princeton University Press, 1992.

Medvedev, Zhores A. The Legacy of Chernobyl, W.W. Norton & Company, 1990.

Miller, Alan S., and Moore, Curtis "Japan And the Global Environment: Problem Solver or Problem Maker?" Japan's Economic Study Papers, Congressional Information Service, J842-18. November 1990.

Mould, Richard F., Chernobyl: The Real Story, Pergamon Press, 1988.

Nowells, Larry Q. "Japan's Foreign Aid Program: Adjusting to the Role of the World's Leading Donor," Congressional Information Service, J842-18, November 1990.

Organization for Economic Co-Operation and Development (OECD), Environmental Policy: How to Apply Economic Instruments, OECD, 1991.

Pearson, Charles S., ed. Multinational Corporations, Environment, and The Third World, Duke University Press, 1987.

Reilly, William K. "A World in Our Hands," The Washington Post, 22 April 1990.

Research Alert. Future Vision The 189 Most Important Trends of the 1990s, Sourcebooks Trade, 1991.

Riddell, Roger C. Foreign Aid Reconsidered, Johns Hopkins University Press, 1987.

Robinson, Julian P., The Effects of Weapons on Ecosystems, Pergamon Press, 1979.

Romm, Joseph J. Defining National Security: The Nonmilitary Aspects, The Council on Foreign Relations Press, 1993.

Rosenbaum, Walter A. Environmental Politics and Policy, Congressional Quarterly Press, 1991.

Sagan, Leonard A., et al. Human and Ecologic Effects of Nuclear Power Plants, Charles C. Thomas, 1974.

Schell, Jonathan, The Fate of the Earth, Alfred A. Knopf, 1982.

Shulman, Seth. The Threat at Home, Confronting the Toxic Legacy of the U.S. Military, Beacon Press, 1992.

Simons, Marlise, "Europeans Begin to Calculate the Price of Pollution," The New York Times, 09 December 1990.

Smith, Deborah Takiff, ed. Agriculture and the Environment: the 1991 Yearbook of Agriculture, U.S. Government Printing Office, 1991.

Stone, Roger D. and Hamilton, Eve. Global Economics and the Environment, Council on Foreign Relations Press, 1991.

Thompson, Jon. "East Europe's Dark Dawn," National Geographic, June 1991.

Tobin, Richard J. The Expendable Future U.S. Politics and the Protection of Biological Diversity, Duke University Press, 1990.

Treverton, Gregory F., ed. The Shape of the New Europe, Council on Foreign Relations Press, 1992.

Uhlig, Mark. A. "Mexican Debt Deal May Save Jungle" The New York Times, 26 February 1991.

U.S. Government Accounting Office (GAO). International Environment: Strengthening the Implementation of Environmental Agreements, U.S. GAO, 1992.

Wilhelm, John, ed. U.S. Foreign Assistance: Investment or Folly? Praeger Publishers, 1984.

Wilson, Thomas W., Jr. International Environmental Action, University Press of Cambridge, Mass., 1971.

Woolard, E.S., Jr. "An Industry Approach to Sustainable Development" Issues in Science and Technology Spring, 1992.

World Bank. World Development Report 1992: Development and the Environment, Oxford University Press, 1992.

World Commission on Environment and Development, Our Common Future, Oxford University Press, 1991.

World Resources Institute. Global Biodiversity Strategy. World Resources Institute. 1992.

Wright, Robin, and McManus, Doyle. Flashpoints: Promise and Peril in a New World, Fawcett Columbine, 1991.

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